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| EXAMINER |
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SAVANI, AVINASH A

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3749

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                     |  |
|------------------------------|--------------------------------------|-------------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/568,119 | <b>Applicant(s)</b><br>PRADE, BERND |  |
|                              | <b>Examiner</b><br>AVINASH SAVANI    | <b>Art Unit</b><br>3749             |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2011.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 16-29 and 31-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 16-29 and 31-35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 February 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Status of Claims***

1. The following action is in response to the applicant's Amendment dated 2/14/2011, that was in response to the Office action dated 12/8/2010. Claims 16-29 and 31-35 are pending, claims 16, 17, 24, 26 and 34 have been amended, while claims 1-16 and 30 have been cancelled by way of a previous amendment.

### ***Response to Arguments***

2. Applicant's arguments with respect to claims 16-29 and 31-34 have been considered but are moot in view of the new ground(s) of rejection. Regarding claim 34, the scope of the claim is believed to have been changed. Changing of "surrounded by" to "surrounding" changes the interpretation from a first element is near a second element, i.e. an element is surrounded by other objects, wherein surrounding is more tied to the term concentric, and that the requirement is now interpreted to mean a first element is inside the other element, wherein concentric was previously interpreted to mean one element having a common axis with the other element, and in the same light concentric is now more tied to surrounding.

### ***Claim Objections***

3. Claims 16, 24 and 34 are objected to because of the following informalities: There is believed to be a matter of enablement regarding the claims, specifically with reference to the tangential component. From the applicant's specification, the closest structure to the tangential component described is a swirling catalytic component, reasonably interpreted as a swirl vane with catalytic qualities. However, the claims lack

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a description of a feature, and therefore a wide range of interpretations are believed to define over the claims. For example, the tangential component is not necessarily claimed to be disposed within the radially inward flow path of the catalytic burner (35B, 43C), but merely there is a component disposed to impart swirl, and is required to be tangential. The claim also require that the outer wall of the burner impart the swirl, which also raises the question as to where/what in the burner wall provides for this function. Again a reasonable interpretation is believed to be a component that is disposed in the flow path (31A) that can impart swirl. For these reasons, a lack of enablement is believed to be seen in the claims. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 16 recites the limitation "flow channel" in line 9. There is insufficient antecedent basis for this limitation in the claim. The limitation is believed to be properly represented as "annular flow channel".

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 16 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCarty et al [6015285], further in view of Kavonius [6488016]

9. With respect to claim 16, McCarty discloses a method of combusting a fuel in a catalytic combustion system, comprising: providing a catalytic burner comprising providing a catalytic burner comprising a first catalytic element (10) disposed in a first flow path, the first flow path in fluid communication with and disposed upstream with respect to a direction of flow within a primary burner, the primary burner comprising an annular flow channel [see FIG 1, col 6, line 41-50]; reacting fuel supplied by the catalytic burner fuel supply in a catalytic pre-reaction by exposing the fuel and the air flow to the catalytic element [col 5, line 31-col 6, line 37]; and continuing to burn the pre-reacted fuel in a secondary reaction located in the primary burner located downstream of the pre-reaction [col 9, line 54-col 10, line 61], however does not disclose the tangential component as further claimed. Kavonius teaches a similar method, that if used to modify McCarty would show directing the pre-reacted fuel from the first flow path into the flow channel direction comprising a component (10) tangential to the first flow path at such that the flow channel outer wall is effective to impart a circumferential motion to

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the pre-reacted fuel in the flow channel, causing the pre-reacted fuel to flow in a helical flow path in the flow channel [see abstract, FIG 1, col 2, line 52-67]. It is understood that the teachings of Kavonius are for a vehicle, however despite the scale of the device, the modification would involve placing the structure (10) of Kavonius into the flow channel of McCarty, wherein the radially inward flow (as shown by McCarty) would then have swirl imparted thereon, also the swirl rod (10) would then be assumed to be in contact with the flow channel wall, showing an outer wall that can impart swirl. The device would be arranged tangentially to the incoming fuel flow, since the rod (10) would be disposed in the fuel flow channel. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the method of McCarty to provide the component (10) as taught by Kavonius because it was known to impart swirl on incoming fuel, yielding the predictable result of providing for more efficient fuel combustion.

10. With respect to claim 24, McCarty discloses a burner for burning a dual gas/liquid fuel, comprising: a primary burner comprising a primary channel, wherein the primary flow channel comprises a primary flow channel outlet [see FIG 1]; and a catalytic burner comprising a catalytically effective element (10) disposed in a catalytic burner flow channel, wherein the fuel is catalytically reacted via exposure to the catalytically effective element [see FIG 1, col 5, line 31-col 6, line 50], however does not disclose a burner creating a vortex. Kavonius teaches a similar device having having a primary flow channel arranged to direct fuel along a direction tangential to the primary flow channel burner fuel outlet such that wherein a primary flow channel outer wall imparts circumferential motion to the pre-reacted fuel effective to create a vortex in the primary

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flow channel [see abstract, FIG 1, col 2, line 52-67]. It is understood that the teachings of Kavonius are for a vehicle, however despite the scale of the device, the modification would involve placing the structure (10) of Kavonius into the flow channel of McCarty, wherein the radially inward flow (as shown by McCarty) would then have swirl imparted thereon, also the swirl rod (10) would then be assumed to be in contact with the flow channel wall, showing an outer wall that can impart swirl. The device would be arranged tangentially to the incoming fuel flow, since the rod (10) would be disposed in the fuel flow channel. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the method of McCarty to provide the component (10) as taught by Kavonius because it was known to impart swirl on incoming fuel, yielding the predictable result of providing for more efficient fuel combustion.

11. Claims 17-23, 25-29, and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCarty et al ['285], in view of Kavonius ['016], further in view of Pfefferle et al [6048194].

12. With respect to claim 17, McCarty discloses the method as claimed in claim 16, [col 5, line 31-40], however does not disclose the creation of the vortex. Pfefferle teaches a similar device where a vortex is created, and the secondary reaction occurs in the vortex [see FIG 2, col 3, line 46-53, line 59-67, col 4, line 1-10, line 44-65]. In view of Pfefferle, the secondary reaction occurs in the vortex. It would have been obvious to a person of ordinary skill in the art at the time of the invention to provide a swirling component because the technique was known in the art, yielding the predictable result of lowering NO<sub>x</sub> emissions by lowering burner temperature.

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13. With respect to claim 18, McCarty discloses the method as claimed in claim 17, however does not disclose the length of the burner depending on the dwell time of the pre-reacted fuel. Pfefferle teaches a similar device wherein the combined length of the catalytic burner, primary burner and combustion space are determined based on a dwell time of the pre-reacted fuel [col 1, line 35-40]. In view of Pfefferle, the identification of the problem of a short channel limiting catalyst residence time shows the awareness of having the length of the burner depend on the dwell time. It would have been obvious to a person of ordinary skill in the art at the time of the invention to have the combined length of the device based on the dwell time of the pre-reacted fuel because it was known that the length of has an effect on the residence time of the catalyst reaction, therein showing that varying the length varies the catalyst reaction.

14. With respect to claim 19, McCarty discloses the method as claimed in claim 18, wherein the catalytic burner, primary burner and combustion space are arranged next to each other in sequence along a path of the air flow [see FIG 1].

15. With respect to claim 20, McCarty discloses the method as claimed in claim 19, however does not disclose the secondary reaction as further claimed. Pfefferle teaches a similar method wherein the secondary reaction is a homogeneous non-catalytic reaction [see abstract]. It would have been obvious to a person of ordinary skill in the art at the time of the invention to have a secondary reaction as claimed because the technique was known in the art, yielding the predictable result of limiting NO<sub>x</sub> formation.

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16. With respect to claim 21, McCarty discloses the method as claimed in claim 20, wherein the fuel is completely burned in the secondary reaction [col 9, line 54-col 10, line 61].

17. With respect to claim 22, McCarty discloses the method as claimed in claim 21, wherein the dual gas/liquid fuel is either a fuel gas or a fuel oil [col 10, line 47-61]. The use of methane suggests a fuel gas.

18. With respect to claim 23, McCarty discloses the method as claimed in claim 22, wherein the fuel is a fuel gas during a first operating mode of the catalytic combustion system [col 8, line 48-53], however does not disclose the second operation mode as claimed. This, however is believed to be well known in the art to have different operation modes that with respective fuels, therefore it would have been obvious to a person of ordinary skill the art to have a second operating mode wherein a fuel is a fuel oil during a second operating mode catalytic combustion system because this feature offers versatility which is a common goal through innovation.

19. With respect to claim 25, McCarty discloses the burner as claimed in claim 24, wherein the fuel is a fuel gas during a first operating mode of the catalytic burner [col 5, line 5, line 31-col 6, line 37] however does not disclose the second operation mode as claimed. This, however is believed to be well known in the art to have different operation modes that with respective fuels, therefore it would have been obvious to a person of ordinary skill the art to have a second operating mode wherein a fuel is a fuel oil during a second operating mode catalytic combustion system because this feature offers versatility which is a common goal through innovation.

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20. With respect to claim 26, McCarty discloses the burner as claimed in claim 25, wherein the catalytic burner comprises a plurality of flow channels, a catalytic burner fuel output for each flow channel, and at least one catalytically effective element per catalytic burner output [see FIG 1], however does not disclose the outer wall imparting swirl. Kavonius teaches a similar burner wherein each primary flow channel outer wall imparts circumferential motion to the pre-reacted fuel effective to create a vortex about the common longitudinal axis [see abstract, FIG 1, col 2, line 52-67]. It is understood that the teachings of Kavonius are for a vehicle, however despite the scale of the device, the modification would involve placing the structure (10) of Kavonius into the flow channel of McCarty, wherein the radially inward flow (as shown by McCarty) would then have swirl imparted thereon, also the swirl rod (10) would then be assumed to be in contact with the flow channel wall, showing an outer wall that can impart swirl. The device would be arranged tangentially to the incoming fuel flow, since the rod (10) would be disposed in the fuel flow channel. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the method of McCarty to provide the component (10) as taught by Kavonius because it was known to impart swirl on incoming fuel, yielding the predictable result of providing for more efficient fuel combustion.

21. With respect to claim 27, McCarty discloses the burner as claimed in claim 26, wherein the catalytically effective element is a honeycomb catalytic converter [see FIG 2a].

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22. With respect to claim 28, McCarty discloses the burner as claimed in claim 27, wherein the honeycomb catalytic converter basic component is selected from the group consisting of titanium dioxide, silicon oxide and zirconium oxide [col 7, line 66-67, col 8, line 32-40]

23. With respect to claim 29, McCarty discloses the burner as claimed in claim 28, wherein the honeycomb catalytic converter catalytically active component is a noble metal or metal oxide which has an oxidizing effect on the fluid fuel [see table 2]

24. With respect to claim 31, McCarty discloses the burner as claimed in claim 29, however does not disclose the perpendicular arrangement of the catalytically effective elements as further claimed. Pfefferle teaches a similar device wherein the catalytically effective elements are arranged in a plane perpendicular to the common longitudinal axis.direction of flow, effective element [see FIG 2, col 3, line 46-53, line 59-67, col 4, line 1-10, line 44-65]. In view of Pfefferle, a vortex is created and the fuel is discharged into the flow channel as claimed. It would have been obvious to a person of ordinary skill in the art at the time of the invention to provide a vortex component because the technique was known in the art, yielding the predictable result of lowering NO<sub>x</sub> emissions by lowering burner temperature.

25. With respect to claim 32, McCarty discloses the method as claimed in claim 31, however does not disclose the length of the burner depending on the dwell time of the pre-reacted fuel. Pfefferle teaches a similar device wherein the combined length of the catalytic burner, primary burner and combustion space are determined based on a dwell time of the pre-reacted fuel [col 1, line 35-40]. In view of Pfefferle, the identification of

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the problem of a short channel limiting catalyst residence time shows the awareness of having the length of the burner depend on the dwell time. It would have been obvious to a person of ordinary skill in the art at the time of the invention to have the combined length of the device based on the dwell time of the pre-reacted fuel because it was known that the length of has an effect on the residence time of the catalyst reaction, therein showing that varying the length varies the catalyst reaction.

26. With respect to claim 33, McCarty discloses he burner as claimed in claim 32, wherein the catalytic burner, primary burner and flow channel are arranged next to each other in sequence along a path of the air flow [see FIG 1].

27. Claims 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Monty et al [6279323], further in view of McCarty et al [6015285]

28. With respect to claim 34, Monty discloses a combustion chamber for a gas turbine engine. It is believed that when combined with McCarty, there is showing of obviousness in teaching the claimed invention, at least with respect to claim 34. Monty discloses a combustion chamber (30), combustion chamber wall (24, 26), heat resistant elements (24a, 24b, 26a, 26b) a primary burner (28), having annular flow channels [col 3, line 33-38] wherein the burner wall allows for swirling of combustion flow. From the above citation, it is understood that there are two burners, however they lack catalytic elements. McCarty teaches a burner with two catalytic burners [see FIG 1, col 5, line 31-col 6, line 3]. Therefore the modification would be to place these catalytic elements in the annular spaces of the fuel injector for the burner, yielding the invention as claimed. The walls of Monty allow for swirling as can be seen via the swirl cup [col 3,

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line 46-55]. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the system of Monet to include the first and second catalytic burners of McCarty because the teachings show a means to provide greater burner efficiency, yielding the predictable result of reducing NOx.

29. With respect to claim 35, Monty discloses combustion chamber as claimed in claim 34, wherein the fuel is either a fuel gas or a fuel oil [see abstract].

### ***Conclusion***

30. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AVINASH SAVANI whose telephone number is

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(571)270-3762. The examiner can normally be reached on Monday- Friday, alternate Fridays off, 7:30-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven McAllister can be reached on 571-272-6785. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Avinash Savani/  
Examiner, Art Unit 3749

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4/22/2011

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